

Seeds and cuttings from selected Ohio populations were gathered 6 July 1988 by Joyce C. Foster, USDA, Beckley, West Virginia. Viable seeds germinated after refrigeration for two months followed by scarification with sandpaper. The cuttings also rooted successfully.

#### DECLINE

The number of historic collections of this species indicates that *Trifolium stoloniferum* formerly was relatively frequent in central and southwest Ohio, particularly in the vicinity of Cincinnati. The twentieth century saw a remarkable and sudden change. What factors lead to this precipitate decline?

Habitat destruction is the obvious answer to this question. However, the species itself grows in disturbed situations and probably requires disturbance to maintain itself. Campbell et al. (1988) suggested the best answer to this paradox—the lack of historical continuity of disturbance.

Running buffalo clover apparently has a poor dispersal mechanism. Deforestation created many new habitats, but there was no efficient means by which the species could move into new sites from remnant populations. The destruction of the original forest coincided with the decimation of the herbivores upon which the clover probably depended for dispersal. The new openings quickly were usurped by alien species such as *Trifolium repens*. Deer virtually disappeared from Ohio in the nineteenth century and only have flourished under management in the past 50 years.

In the twentieth century the lack of disturbance probably played a contradictory role in the decline of running buffalo clover. Woodlands were allowed to mature, increasing the shade under which the clover cannot grow. Remnant populations became even more isolated, persisting in openings maintained by appropriate disturbance. At least some of the extant populations of running buffalo clover may have persisted in place for several decades.

The high palatability of this species also may have contributed to its decline. The cattle of European settlers were greater in number than the indigenous herbivores. The grazing pressure was much more intense than in pre-settlement times.

Other biological and environmental factors as yet unknown may have contributed to the decline of *Trifolium stoloniferum*. Among these possibilities are disease and the disappearance of a pollinator and resultant reduction in outbreeding. Suppression of woodland fires might have led to the closure of suitable habitats. *Trifolium stoloniferum* is the only taxon in this genus which lacks rhizobial bacteria (Campbell et al. 1988). Has the infecting bacterium been lost?

Some or all these factors probably acted in concert and led to the virtual extirpation of running buffalo clover from Ohio and most of its geographic range.

#### MANAGEMENT AND PRESERVATION

Successful management for *Trifolium stoloniferum* must tread a thin line between too little and too much disturbance. Most populations have withstood mowing or trampling over time with little effect. Mowing seems especially important in controlling the alien weedy species Japanese honeysuckle (*Lonicera japonica* Thunb.) and garlic-mustard (*Alliaria petiolata* (Bieb.) Cavara and Grande. (This latter species often is known by the later name *A. officinalis* Andr. ex Bieb.; see Clapham et al. 1962). At the Miami Fort the unmown woodlands and shady openings are carpeted with garlic-mustard. This species is only a minor element of the groundcover in the area maintained by regular mowing. There seems no reason to drastically alter existing disturbance regimes. Mowing might be suspended in early May to allow flowering and resumed in mid July after seed set.

The prospects are bright for preserving *Trifolium stoloniferum* in Ohio. Four populations, including Ohio's largest, are owned by the Hamilton County Park District. The park district is most willing to cooperate in protecting these populations and plans to monitor the species over time. The presence of running buffalo clover will be taken into account in management plans being prepared by the Ohio Historical Society for the cemetery site (M. Pratt, pers. comm. 1988). The owners of the dooryard sites have registered their populations with ODNAP as Ohio Natural Landmarks.

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